What is claimed is:

1. A method for controlling the heading of a watercraft, comprising:

acquiring a desired heading of the watercraft;

acquiring an actual heading of the watercraft at time T_0;

calculating a heading error by comparing the desired heading with the actual heading;

determining a rate of change of the heading error:

determining algorithm gains used to control at least one of the amount and rate of a deflection of a nozzle of the watercraft for use in maintaining the heading of the watercraft;

determining a value for a nozzle control signal by taking into account each determined algorithm gain;

determining an amount of deflection for a nozzle of the watercraft, for altering a heading of the watercraft, based on the value for the nozzle control signal;

deflecting the nozzle based on the determined amount of deflection;

repeating the above steps until the actual heading equals the desired heading.

2. A method as in claim 1, wherein at least one of the amount of deflection of the nozzle and a rate of nozzle deflection is limited based on an RPM of an engine of the watercraft.

3. A method as in claim 1, and further comprising:

determining whether a bow thruster of the watercraft is active;

selecting the algorithm gains from a first set of gain data if the thruster is active and from a second set of gain data if the thruster is not active.

4. A method as in claim 1, and further comprising:

selecting the algorithm claims from various sets of data based on at least one of: engine RPM, watercraft speed, rudder or steering device position, position of a reversing bucket associated with a nozzle of the watercraft, direction of force of a thruster of the watercraft, operating mode of the watercraft and a positioning of an operator's watercraft control interface.

5. A method as in claim 1, and further comprising:

acquiring the actual heading from a heading sensor.

6. A method as in claim 5, wherein the heading sensor is a three axis heading sensor.

7. A method as in claim 6, and further comprising:

measuring a pitch and a roll of the watercraft and using such data to correct a signal from the heading sensor for error due to pitch and roll.

8. A method as in claim 5, and further comprising:

determining whether magnetic disturbance is occurring that can affect the accuracy of the heading from the heading sensor;

selecting the algorithm gains from a first set of gain data if a magnetic disturbance is not occurring and from a second set of gain data if a magnetic occurrence is occurring, wherein the second set of gain data respectively lowers a factor weighting from the gains that are derived

from a magnetic source affected by the magnetic disturbance and raises a factor weighting for gains not derived from a magnetic source affected by the magnetic disturbance.

9. A method as in claim 8, wherein the algorithm gains are a P gain, I gain and D gain and the nozzle control signal Control OutT_0 is determined by summing the values for PtermT_0, ItermT_0, and DtermT_0; where PtermT_0, ItermT_0, and DtermT_0 are determined using the following equations:

$$\text{PtermT}_0 = P * \text{Heading Error}$$

$$\text{ItermT}_0 = \text{ItermT}_{0\text{-}1} + (I * \text{Heading Error} * (T_0 - T_{0\text{-}1}))$$

$$\text{DtermT}_0 = D * \text{Rate of Change of Heading Error}$$

wherein P, I and D are the determined P gain, I gain and D gain, respectively;

resetting T_0 to T_{0+1} and then repeating the steps until the actual heading equals the desired heading.

10. A method as in claim 9, wherein, if a magnetic occurrence is occurring, the factors for the P gain and I gain are given a lower weight and the factor for the D gain is given a higher weight.

11. A method as in claim 8, wherein, during a relatively long term magnetic disturbance, an offset is added to an affected axis of a magnetic sensor to negate the magnetic disturbance, the offset based on a predetermined measurement of the affect of the magnetic disturbance on the magnetic sensor.

12. A method as in claim 1, comprising:

determining whether the watercraft is planing, based on watercraft pitch and rpm measurements and adjusting the algorithm gains in such an instance to compensate for the planing.

13. A method as in claim 1, comprising:

deflecting the nozzle based on the determined amount of deflection at all speeds without intervention of a watercraft operator.

14. A method for calculating a heading of a watercraft, comprising:

acquiring a heading of the watercraft at a base time;

acquiring a heading turn rate from an angular rate of turn sensor of the watercraft at a later time;

determining whether the acquired heading is believed accurate at the later time;

if the acquired heading is believed inaccurate, calculating a heading of the watercraft based on the heading turn rate and the originally acquired heading;

outputting the calculated heading for control of the heading of the watercraft.

15. A method as in claim 14, comprising:

acquiring the heading from a heading sensor of the watercraft;

determining whether the acquired heading is believed accurate at the later time by determining whether the heading turn rate exceeds a threshold indicative that the heading from the heading sensor is not accurate.

16. A method as in claim 15, comprising:

repeating the steps from acquiring the heading turn rate for as long as the acquired heading turn rate exceeds the threshold.

17. A method as in claim 16, comprising:

wherein the calculation for the heading equals:

$$\text{Acquired Heading } T_0 + \text{Heading Turn Rate} T_{0+1} * (T_{0+1} - T_0)$$

where T_0 is the base time and T_{0+1} is the later time.

1815. A method as in claim 15, comprising:

outputting the acquired heading for control of the heading of the watercraft if the heading rate does not exceed the threshold.

19. A method as in claim 18, comprising:

after outputting the acquired heading, acquiring a new heading from the heading sensor and repeating the steps thereafter.

20. A method as in claim 14, comprising:

acquiring the heading of the watercraft from a GPS unit;

determining whether the acquired heading is believed accurate at the later time by determining whether an updated heading from the GPS unit is available at the later time;

calculating the heading of the watercraft based on the heading turn rate and the acquired heading from the GPS unit.

21. A method as in claim 20, comprising:

omitting the step of calculating the heading if an updated heading from the GPS unit is available and outputting such updated heading for control of the heading of the watercraft;

resetting the base time and repeating the steps from acquiring the heading turn rate.

22. A method as in claim 21, comprising:

wherein the calculation for the heading equals:

$$\text{Acquired Heading } T_0 + \text{Heading Turn Rate} T_{0+1} * (T_{0+1} - T_0)$$

where T_0 is the base time and T_{0+1} is the later time.

23. A method as in claim 14, comprising:

acquiring the heading from a heading sensor of the watercraft;

determining whether the acquired heading is believed accurate at the later time by determining whether a disturbance has occurred to the heading sensor.

24. A method as in claim 23, comprising:

repeating the steps from acquiring the heading turn rate for as long as the disturbance is occurring.

25. A method as in claim 24, comprising:

wherein the calculation for the heading equals:

$$\text{Acquired Heading } T_0 + \text{Heading Turn Rate} T_{0+1} * (T_{0+1} - T_0)$$

where T_0 is the base time and T_{0+1} is the later time.

26. A method as in claim 23, comprising:

outputting the acquired heading for control of the heading of the watercraft if a disturbance to the heading sensor is not occurring.

27. A method as in claim 26, comprising:

after outputting the acquired heading, acquiring a new heading from the heading sensor and repeating the steps thereafter.

28. A method as in claim 23, wherein the heading sensor is a gimbaled type sensor and determining whether a disturbance is occurring is done by measuring for at least one of: vibration and shock.

29. A method for correcting a heading of a watercraft, comprising:

measuring an amount of error induced by the effect of at least one disturbance on at least one of x, y and z heading data from a heading sensor;

acquiring at least one of x, y and z heading data from a heading sensor;

determining whether the at least one disturbance is occurring;

correcting the heading data in the occurrence of a disturbance by adding a correction value to the heading that offsets the measured amount of error induced by the disturbance;

outputting the corrected heading data for control of the heading of the watercraft.

30. A method as in claim 29, wherein the at least one disturbance affects one of the x, y and z data and the heading data is corrected by adding the correction value to the affected one of the x, y and z data.

31. A method as in claim 30, wherein the at least one disturbance affects at least two of the x, y and z data and the heading data is corrected by adding the correction value to the affected two of the x, y and z data.

32. A method as in claim 30, comprising:

determining the correction value based on at least one axis that is not disturbed by the disturbance.

33. A method as in claim 30, wherein the heading sensor is a magnetic heading sensor and the disturbance is at least one of: operating a bow thruster of the watercraft, operating a reversing bucket of the watercraft, and operating other electrical equipment of the watercraft.

34. A method for controlling roll out of a watercraft, comprising:

determining whether a nozzle control apparatus is off center to alter a position of a nozzle of the watercraft;

if the nozzle control apparatus is off center, setting a nozzle control command to a nozzle control apparatus command;

determining whether the nozzle control apparatus has been returned to a center position;

if the nozzle control apparatus has been returned to a center position, setting a nozzle control command to oppose a turn of the watercraft.

35. A method as in claim 34, wherein if the nozzle control apparatus has been returned to a center position, setting the nozzle control command to a position predetermined for the watercraft based on operating data of the watercraft.

36. A method as in claim 35, comprising:

determining a heading rate for the watercraft;

if the nozzle control apparatus has been returned to a center position, setting a nozzle control command to a negative of the heading rate multiplied by a constant factor predetermined for the watercraft based on operating data of the watercraft.

37. A method as in claim 36, and further comprising;

after the setting of the nozzle control command to the negative of the heading rate multiplied by the constant factor, determining whether the nozzle control apparatus has been returned to off center and if so, repeating the steps from setting the nozzle control command to the nozzle control apparatus command.

38. A method as in claim 36, and further comprising:

after the setting of the nozzle control command to the negative of the heading rate multiplied by the constant factor, determining whether the nozzle control apparatus is still in the

42. A method as in claim 34, wherein the nozzle control apparatus is a joystick control.

43. A method as in claim 38, wherein the nozzle control apparatus is a joystick control.

44. A method for controlling a watercraft having a rear propulsion device and a thruster, comprising:

during at least one of initiation and cessation of sideways movement of the watercraft by engagement/disengagement of the thruster, prepositioning an angle of the rear propulsion device to provide a sideways force that minimizes vessel yaw prior to the occurrence of a heading error, the prepositioned angle based on the operating characteristics of the watercraft.

45. A method as in claim 44, wherein the rear propulsion device is prepositioned to a first angle for the initiation of a sideways movement and prepositioned to a counterpart second angle for the cessation of sideways movement.

46. A method as in claim 45, wherein the prepositioned angles are based on at least one of; nozzle thrust, engine speed, watercraft speed and a control mode of the watercraft.

47. A method as in claim 44, wherein the rear propulsion device is a rear nozzle.

48. A method for controlling a watercraft having a rear propulsion device and a thruster, comprising:

center position, and if so, determining whether the heading rate is below a first predetermined threshold indicating that turning of the watercraft has essentially stopped;

if the heading rate is not below the first predetermined threshold, returning to the step of setting of the nozzle control command to the negative of the heading rate multiplied by the constant factor and repeating the steps thereafter.

39. A method as in claim 38, and further comprising:

if the heading rate is below the first predetermined threshold, returning to the first step of determining whether the nozzle control apparatus is off center and repeating the steps thereafter.

40. A method as in claim 38, and further comprising:

reducing any heading sensor filtering prior to determining whether the nozzle control apparatus has returned to center;

prior to determining whether the heading rate is below the first predetermined threshold and after the step of determining whether the nozzle control apparatus is still in the center position, restoring the heading sensor filtering if the heading rate is below a second predetermined threshold, higher than the first predetermined threshold, indicating that turning of the watercraft has essentially stopped based on unfiltered heading sensor data, with the first predetermined threshold being based on filtered heading sensor data.

41. A method as in claim 38, and further comprising:

changing heading sensor filtering as a function of a heading rate.

reducing the effect of electro-magnetic field interference from electrical equipment of the watercraft on the accuracy of a heading signal from the magnetic sensor by changing a use of the heading signal based on at least one of a function mode of the watercraft and a position of a vessel movement control apparatus by at least one of: compensating for the field interference and acquiring the heading signal only when electro-magnetic interference is sufficiently low to prevent substantive inaccuracy of the heading data.

53. A method as in claim 52, comprising;

offsetting one of an x axis signal and a y axis signal from the magnetic sensor an amount proportional to a value of a current draw of interference inducing electrical equipment.

54. A method as in claim 53, comprising;

regulating the current draw of the interference inducing equipment to maintain a substantively constant electro magnetic field.

55. A method as in claim 53, comprising;

offsetting the one of the signals for a predetermined time after deactivation of the interference inducing equipment to allow the interference field to decay before the signal offset is removed.

56. A method as in claim 52, comprising;

initiating a sideways movement of the watercraft by engaging the rear propulsion device while delaying engagement of the thruster;

engaging the thruster after a first predetermined time delay to assist in the sideways movement of the watercraft after a stern of the watercraft has gained sideways momentum from the rear propulsion device, the first predetermined time delay based on the operating characteristics of the watercraft to minimize yaw of the watercraft during the sideways movement.

49. A method as in claim 48, and further comprising,

ending the sideways movement of the watercraft by disengaging the rear propulsion device of the watercraft and disengaging the thruster after a second predetermined time delay after disengaging the rear propulsion device to allow sideways momentum of the stern of the watercraft to dissipate before disengagement of the thruster, the second predetermined time delay based on the operating characteristics of the watercraft to minimize yaw of the watercraft during cessation of the sideways movement.

50. A method as in claim 48, wherein the rear propulsion device is a rear nozzle.

51. A method as in claim 49, wherein the first predetermined time delay and the second predetermined time delay are substantially the same.

52. A method for compensating for disturbances of a magnetic heading sensor of a watercraft, comprising:

delaying acquiring the heading signal after deactivating operation of interference inducing equipment by a time sufficient to allow the interference field to decay to a non-substantive level.

57. A method as in claim 1, wherein a trim/offset of the watercraft in place before a maneuver is restored after the maneuver.

58. A method as in claim 44, wherein a trim/offset of the watercraft in place before a sideways maneuver is restored after the maneuver.

59. A method as in claim 48, wherein a trim/offset of the watercraft in place before a sideways maneuver is restored after the maneuver.